Risk of Fire from Alcohol-Based Solutions

While flammable liquid germicides (alcohol and alcohol-based solutions) are good antimicrobial agents, their misuse can present a significant fire hazard. These solutions have been used for many years in surgical preparation to prevent infections to patients and are now being used throughout healthcare facilities in the form of hand sanitizers or “hand rubs”.

Alcohol-Based Skin Prep Solutions
A report submitted to PA-PSRS described a patient receiving a second-degree burn and singed hair from the use of an alcohol prep solution during electrosurgery. Another report described a patient’s hair catching fire; though the report did not indicate that an alcohol or alcohol-based prep solution was used, hair catching fire can be indicative of the hair containing alcohol. Although electrosurgery was the ignition source in the two reported events, surgical fires or burns can occur with any ignition source (e.g., electrosurgical unit, electrocautery unit, laser, fiberoptic light source).

A search of the U.S. Food and Drug Administration’s Manufacturer and User Device Experience (MAUDE) database, using the keywords “alcohol AND burn” and “alcohol AND fire” revealed 10 out of 41 reports specifically associating the use of alcohol or alcohol-based solutions with surgical fires or patient burns. The remaining reports were unrelated to prep solutions and surgical fires or burns or lacked information to make an association.

Controversy currently exists over the use of flammable liquid germicides during electrosurgery or electrocautery procedures. Several Authorities Having Jurisdiction* (AHJ), such as the state of Nebraska (state fire marshals, government health and human services departments) and Centers for Medicare and Medicaid Services (CMS), have interpreted National Fire Protection Association Standards for Healthcare Facilities (2005) as permitting the use of nonflammable germicides in anesthetizing locations.

The NFPA 99 standard section 13.4.1.2.2.1 states:

13.4.1.2.2.1 Medicaments, including those dispersed as aerosols, shall be permitted to be used in anesthetizing locations for germicidal purposes.

13.4.1.2.2 Liquid germicides used in anesthetizing locations, whenever the use of cautery or electrosurgery is contemplated, shall be nonflammable.

13.4.1.2.3 Whenever flammable aerosols are employed, sufficient time shall be allowed to elapse between deposition and application of drapes to permit complete evaporation and dissipation of any flammable vehicle remaining.

The controversy arises due to the inconsistencies between flammable aerosols and liquids among the three subsections. Literal interpretation of the sections suggests that the use of flammable aerosols is permitted in anesthetizing locations and that the use of flammable liquids is not. However, the contention is that, since it is the ignition of flammable vapors from the aerosols or liquids that occurs, the interpretation should include the permitted use of both forms of germicides, provided the germicide is properly used and applied to the patient’s skin.

The American Society for Healthcare Engineering (ASHE) of the American Hospital Association has proposed a tentative interim amendment (TIA) to NFPA (NFPA 99) to amend and expand the language to section 13.4.1.2.2. The amendment would include permitting the use of flammable germicide solutions during surgical procedures involving ignition sources such as electrosurgery and electrocautery, with emphasis on the proper use and application of the germicide solutions. We will continue to follow this issue as the controversy develops or the resolution to the controversy develops.

* Authority Having Jurisdiction is a term defined by NFPA to describe federal, state, local, or regional agencies—typically government—concerned with public safety, such as the fire marshal or health department.

This article is reprinted from the PA-PSRS Patient Safety Advisory, Vol. 2, No. 2—June 2005. The Advisory is a publication of the Pennsylvania Patient Safety Authority, produced by ECRI & ISMP under contract to the Authority as part of the Pennsylvania Patient Safety Reporting System (PA-PSRS).

Copyright 2005 by the Patient Safety Authority. This publication may be reprinted and distributed without restriction, provided it is printed or distributed in its entirety and without alteration. Individual articles may be reprinted in their entirety and without alteration provided the source is clearly attributed.

To see other articles or issues of the Advisory, visit our web site at www.psa.state.pa.us. Click on “Advisories” in the left-hand menu bar.
Risk of Fire from Alcohol-Based Solutions (Continued)

A combination of two factors involving alcohol or alcohol-based prep solutions can lead to fire or burns.3-5

- If improperly applied, the solution may wick into the patient’s hair and linens or pool on the patient’s skin, which can prolong the solution’s drying time.
- If the patient is draped before the solution is completely dry, the alcohol vapors can become trapped under the surgical drapes and channeled to the surgical site.

If these conditions occur, a heat source used at the surgical site could ignite the alcohol vapors, resulting in a fire and/or burn. Many clinicians are unaware of the risk of surgical fires or burns associated with the use, or misuse, of alcohol and alcohol-based prep solutions. Practices that may help to reduce this risk include:

- Purchasing skin prep solutions that provide clear and explicit instructions and warnings.
- Ensuring that the prep solution does not soak into hair or linens. Sterile towels can be placed to absorb drips and runs during application, and can then be removed prior to draping the patient.
- Prior to draping, ensuring that the prep solution is completely dry. This may take a few minutes or more depending on the amount and location of the solution. Inspecting the prepped area before draping. Some solutions change appearance when dry (e.g., change from shiny to matte).
- During surgery, being aware of any sudden flash of heat. Such a flash is indicative of an alcohol fire. If a fire is suspected, immediately search for any flaming or smoldering materials, and remove and extinguish them.
- Following prep solutions suppliers’ recommended instructions for use.
- In-service about the proper use and risks of using alcohol and alcohol-based prep solutions could be provided to all surgical staff including nurses, surgeons, and anesthesia providers.

The concern with the hand rub sanitizers is the potential risk of fire from the released vapor from the alcohol-based ingredient of the dispenser. However, on March 25, 2005, CMS amended this Final Rule to allow placing hand rub dispensers in egress corridors. Placing hand rub dispensers in egress corridors is based on certain conditions specified in the amendment. The amendment to the Final Rule became effective on May 24, 2005. Factors influencing the decision to amend the Final Rule are that the dispensers contain a relatively small amount of alcohol-based gel (alcohol-based gel is the most common form of hand rub sanitizers), the dispensers do not release alcohol vapors, and the risk of fire is low when the dispensers are properly installed and used.

Notes

Alcohol-Based Hand Rub Sanitizing Solutions
In January 2003, CMS published a Final Rule in the Federal Register, Fire Safety Requirements for Certain Health Care Facilities (68 FR 1374),7 which included requirements for prohibiting “the placement of accelerants, including alcohol-based hand rub dispensers (ABHR), in egress corridors,” but allowing their placement in patient rooms and other areas.
The Patient Safety Authority is an independent state agency created by Act 13 of 2002, the Medical Care Availability and Reduction of Error ("Mcare") Act. Consistent with Act 13, ECRI, as contractor for the PA-PSRS program, is issuing this newsletter to advise medical facilities of immediate changes that can be instituted to reduce serious events and incidents. For more information about the PA-PSRS program or the Patient Safety Authority, see the Authority’s website at www.psa.state.pa.us.

ECRI is an independent, nonprofit health services research agency dedicated to improving the safety, efficacy and cost-effectiveness of healthcare. ECRI’s focus is healthcare technology, healthcare risk and quality management and healthcare environmental management. ECRI provides information services and technical assistance to more than 5,000 hospitals, healthcare organizations, ministries of health, government and planning agencies, and other organizations worldwide.

The Institute for Safe Medication Practices (ISMP) is an independent, nonprofit organization dedicated solely to medication error prevention and safe medication use. ISMP provides recommendations for the safe use of medications to the healthcare community including healthcare professionals, government agencies, accrediting organizations, and consumers. ISMP’s efforts are built on a non-punitive approach and systems-based solutions.